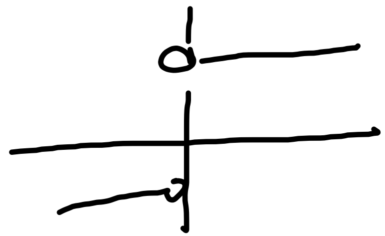
2.1 b more limits

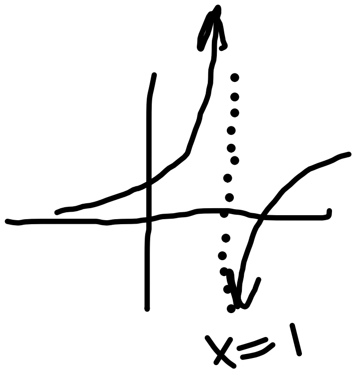
ways the limit fails to exist

1. left $\neq$ right ex $y = \frac{|x|}{x}$

$\lim_{x \to 0} \frac{|x|}{x}$ dne



2. $\lim_{x \to 1} \frac{x^2-4}{x-1}$



vertical asymptote

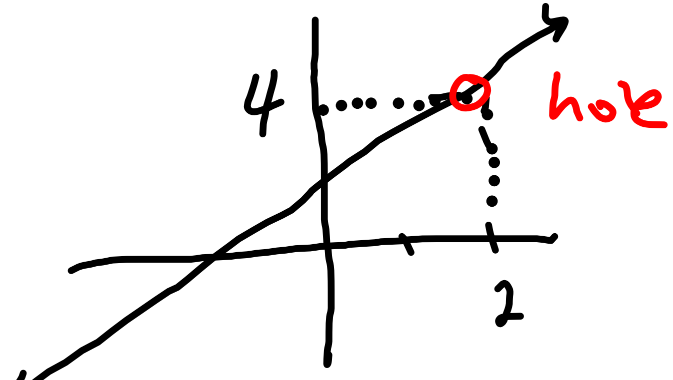
$\lim_{x \to 1^-} f(x) = \infty$ (dne)

$\lim_{x \to 1^+} f(x) = -\infty$ (dne)

$$\lim_{x\to 2}\frac{x^2-4}{x-2}=4$$

$$\frac{0}{0}$$

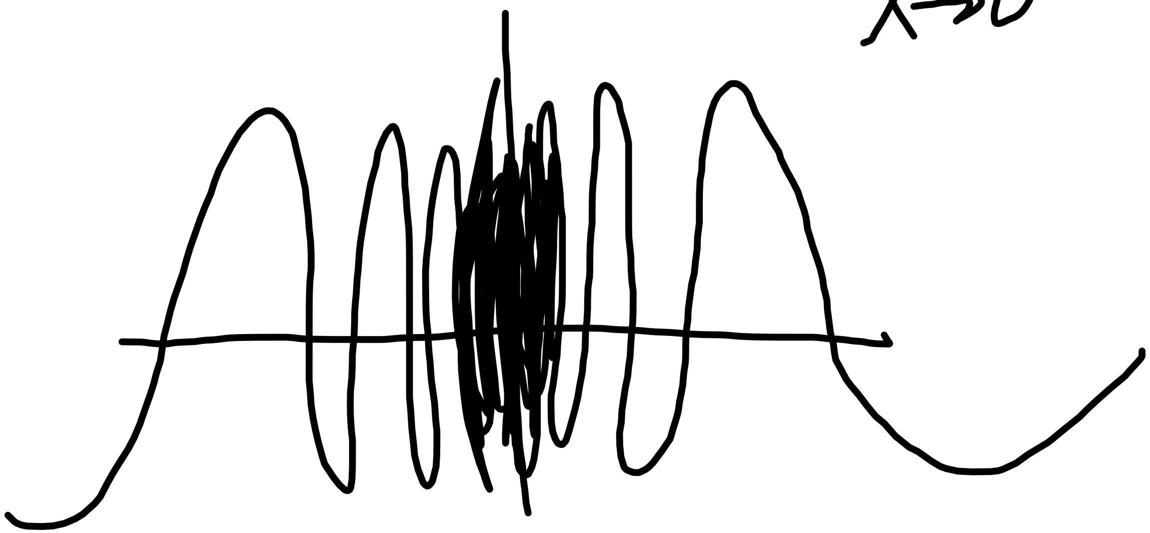
$$\lim_{x\to 2}\frac{(x+2)\cancel{(x-2)}}{\cancel{(x-2)}}$$



$y=x+2$ if $x\neq 2$

another way limits fail to exist:

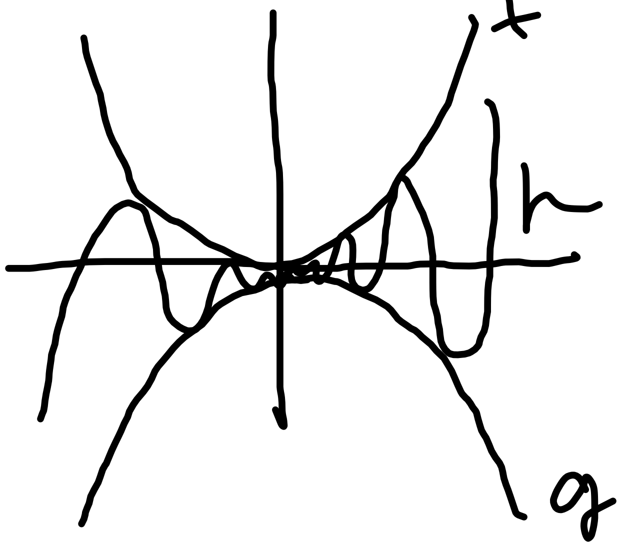
(3.) oscillation $\lim_{x \to 0} \sin \frac{1}{x}$ dne



a limit that does exist

$$\lim_{x \to 0} x^2 \sin\left(\frac{1}{x}\right) = 0$$ p65 fig 2.8

sandwich theorem $\quad g \le h \le f$



if $f, g \to L$

then $h \to L$

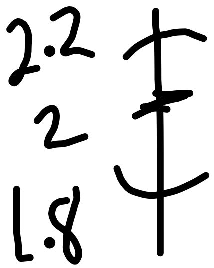
$$\lim_{x \to 4} \sqrt{x} = 2$$

when x is close to 4

$\sqrt{x}$ is close to 2

How close should x be to 4

so that $1.8 \le y \le 2.2$



ans: $3.24 \le x \le 4.84$

graph

$f1 = \sqrt{x}$

$f2 = 1.8$

$f3 = 2.2$